Report on the November 2003 Ohio EPA Ground Water Investigation at the Miller Lumber Site Pike County, Ohio

By
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February 13, 2004

Introduction

On November 19 and 20, 2003, Dave Hunt (DDAGW-SEDO), Dan Bergert (DSIWM-SEDO) and Karl Reinbold (DERR-SIFU) conducted a ground water investigation at the Miller Salvage (AKA Miller Lumber) site in Lapperell, Pike County, Ohio. The investigation was conducted using DERR-SIFU's Geoprobe. The investigation followed the September 2003 Sampling Plan which outlined the number of sampling points, their location, the parameters that would be sampled and the protocols that would be followed. A preliminary report summarizing the field activities was written and sent to DSIWM on December 4, 2003. The December report used the field conductivity at the geoprobe locations to evaluate the potential for ground water contamination at the site. DDAGW-SEDO received the full laboratory analysis in late December 2003. This report is a summary of those results.

Executive Summary

The November 2003 Geoprobe ground water investigation has shown that ground water contamination exists at the Miller Lumber site and it is related to site activities. There is a well defined plume of contamination extending from the leachate holding pond/waste pile area to a seepage area on Kincaid Creek. Maximum Contaminant Levels (MCL) for nitrate and nitrate/nitrite were found to be exceeded in the ground water. Lifetime Exposure Health Advisory levels for ammonia has also been exceeded in the ground water. The Division of Surface Water (DSW) has found exceedances of water quality standards in Kincaid Creek for Ammonia. The ground water data generated to date indicates that the leachate holding pond is a significant source of ground water contamination. The investigation also demonstrates that contaminated ground water discharges to Kincaid Creek. In addition to the ground water discharge to the creek, the Division of Surface Water has provided sampling results that demonstrate that the activities at the Miller Lumber site have affected the water quality in the creek and ultimately Kincaid Spring.

Background

The Miller Lumber Site is located on Lapperell Road in Mifflin Township (Figure 1). The site lies within the floodplain of Kincaid Creek. The ODNR Kincaid Spring Fish Hatchery is 2 miles downstream from the site. The Miller Lumber site consists of a 4.26 acre pile of ground waste particle board from Mills Pride in Waverly, Ohio, 1.54 acre active working area, a leachate holding pond, and a 3 to 5 acre area with residual waste sawdust (Figure 2). The pile and active working area comprise 5.8 acres and can be considered one pile. In 2002 the volume of the waste pile was estimated at 291,000 yds^3 (possibly 97,000 tons of material). The unlined five acre pile is generating leachate with high concentrations of ammonia (~7000 mg/l). The holding pond on the west side of the site is used for collecting the leachate which is recirculated back onto the pile (Figure 3). The leachate is brown to black in color and has a strong ammonia smell.

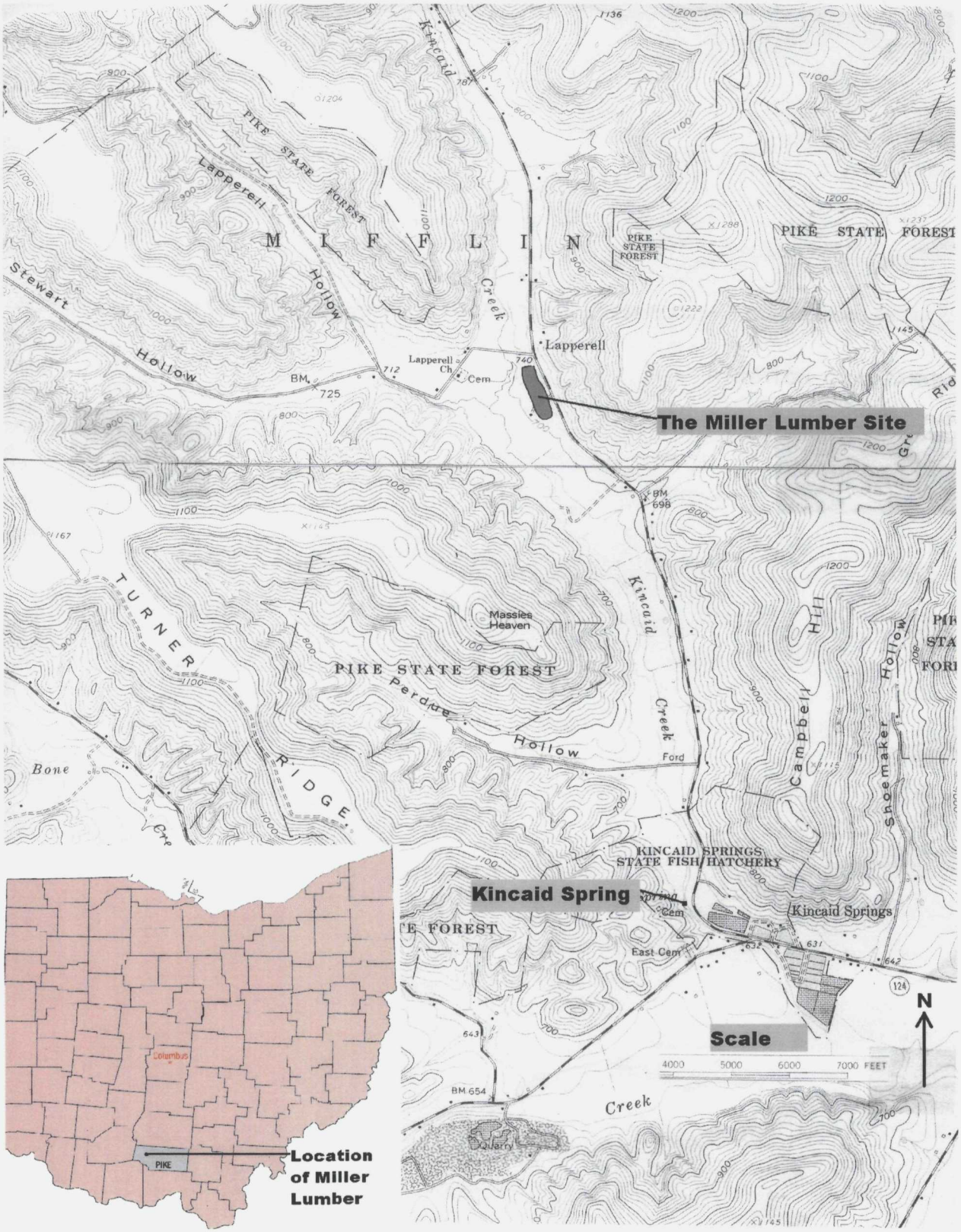


Figure 1 - Location of the Miller Lumber Site

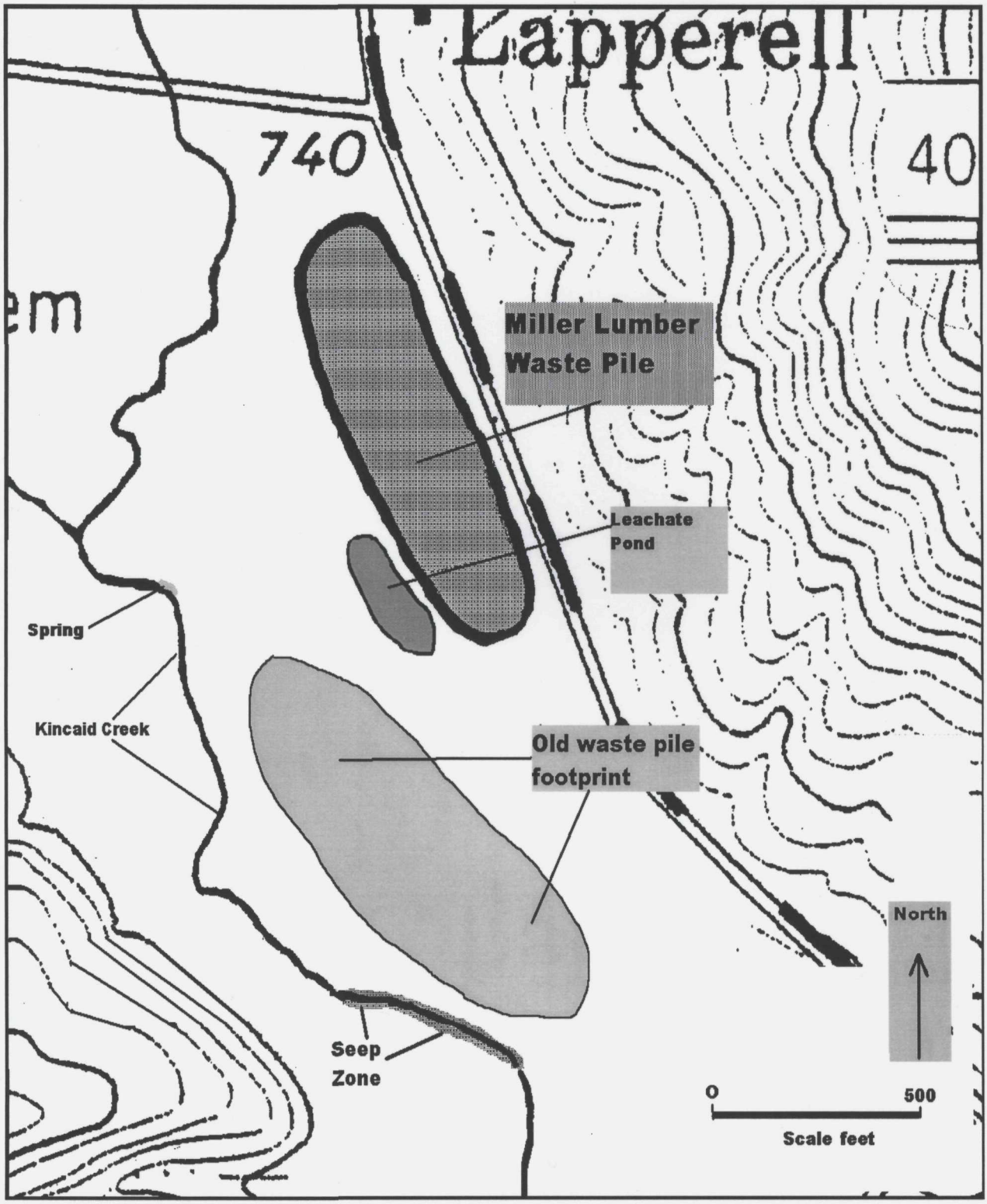


Figure 2 - Map of the Miller Lumber site showing the current waste pile, the old waste pile and the leachate pond relative to Kicaid Creek.

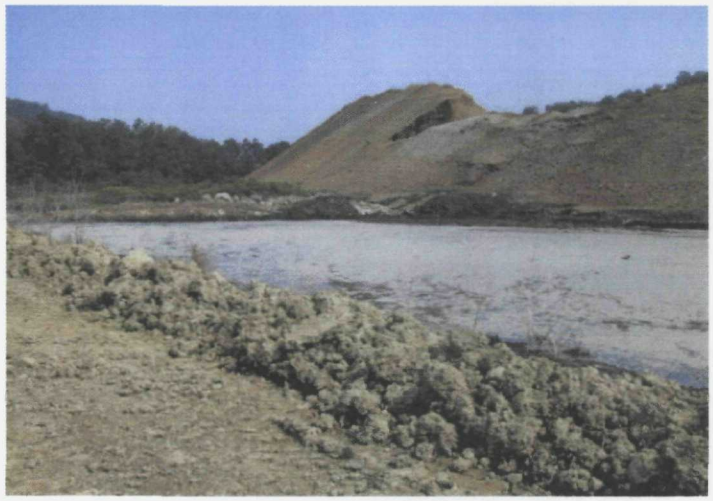


Figure 3 - Leachate pond and waste pile

In August 2003 the leachate holding pond was over topped and the embankment was breached resulting in the discharge of leachate over land for more than 500 feet to Kincaid Creek.

Between the exisitng pile and Kincaid Creek there exists three to five acres of land which is the former location of Miller Lumber's operation (old waste pile footprint). Miller Lumber has taken steps to determine the volume of material that is present in this area. The recent estimate is that 11,000 yds^3 of waste wood material remains in in the old waste pile footprint. Puddles of brown to black water can be seen in this field and are probably the result of a combination of releases from the pond and pooling of rainfall in low areas having residual sawdust.

Kincaid Creek flows over bedrock consisting of black to bluish-gray shale overlying a gray to buff colored dolomite/limestone. The bedrock is highly jointed perpindicular to stream flow. Numerous instances of the blue gray shale collapsing within the creek bed, where the limestone/dolomite below the shale has been dissolved away, are evident. The blue gray shale is likely to be the Devonian Age Olentangy Formation and the limestone/dolomite is likely to be the Devonian Age Delaware Formation. Karst Terrain (areas underlain with limestone and having caves and sinkholes) is present in western Pike County. Karst Terrain maps for the western Pike County area demostrate that there are Silurian carbonates near the site within the stream valleys. Thus, a more detailed evaluation of the bedrock geology would be needed to evaluate whether the shale-limestone outcropping in Kincaid Creek is Devonian or Silurain in age.

There are sink holes in the area near the Miller Lumber site. During the leachate release from the holding pond in August 2003, a sink hole was discovered within the stream bed which redirected stream flow into the subsurface. Fred Miller, owner of Miller Lumber operations, informed OEPA that Kincaid Creek was flowing black and that by his estimate 99% of the stream flow was entering the sink hole at that time. Mr. Miller also stated that the black water was from his site, and the result of the breach of the holding pond. The sink hole in the creek was filled in by Mr. Miller using stream sediment and rock rubble (Figure 4) in an attempt to reduce stream/leachate flow into the opening so Kincaid Spring would not be impacted.

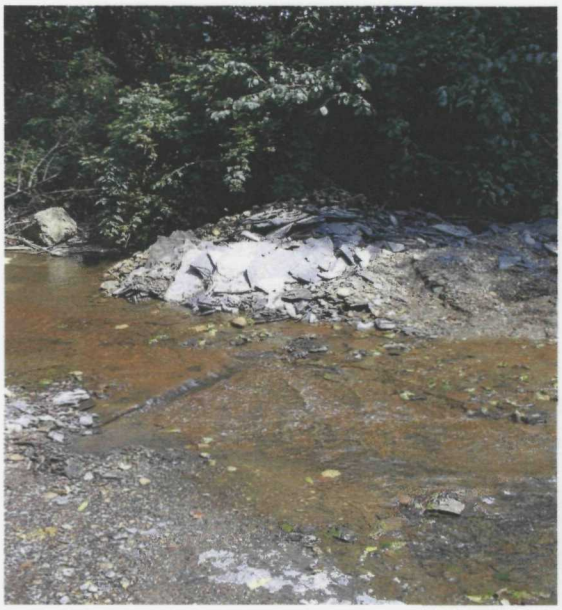


Figure 4 - Filled in collapse. Photo also shows jointing in the creek bed.

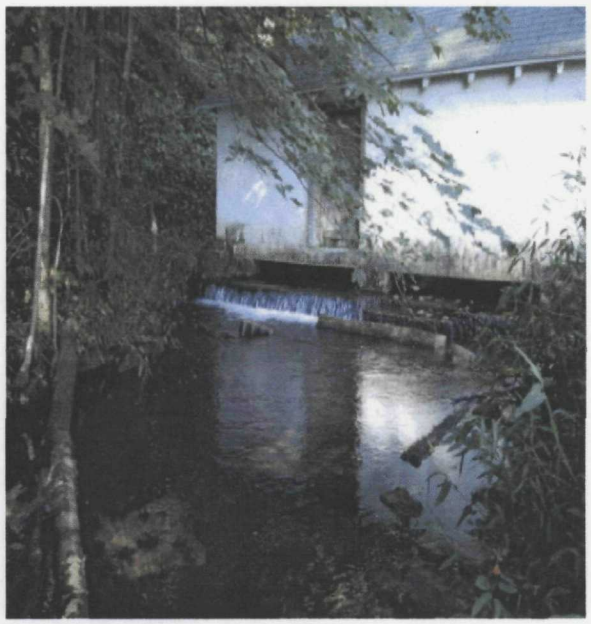


Figure 5 - Kincaid Springs.

Approximately 1.5 miles downstream of the Miller Lumber site is the Kincaid Spring (Figure 5). This spring flows between 1900 gpm to 5000 gpm and is used as the only water source for the ODNR Kincaid Springs Fish Hatchery. Residents living in the Mifflin Township area also use the spring for drinking water due to a high hydrogen sulfide content in private wells.

When the release ~~was~~ occurred at Miller Lumber, the fish hatchery noted that the spring water turned dark in color and took precautions to protect the fish stock at the hatchery. Along Kincaid Creek near the Miller Lumber site, there are seeps on the east stream bank. The seeps have an orange-red to black discoloration. One prominent zone of seepage occurs along Kincaid Creek near the old waste pile footprint. It is estimated that this seep encompassess approximately 200 feet of stream bank (Figure 2).

Ohio EPA performed several sampling events at this site over the summer and fall of 2003 of Kincaid Creek, the seeps on the creek bank, the leachate pond, Kincaid Spring and area private wells installed into limestone. Prior to the geoprobe investigation it was anticipated that ground water was being impacted by the Miller site. This was based on the following observations:

- discolored water coming out of the ground water seeps on the east bank of Kincaid Creek and sampling showed that the seeps had elevated ammonia levels;
- the leachate holding pond liner has been damaged (DSW report 6/08/00);
- there is an unknown quantity of waste along Kincaid Creek within the footprint of the old, unpermitted, unlined waste pile.
- the leachate release from the holding pond in the summer of 2003 would likely infiltrate the floodplain sediments and impact ground water;
- the 5 acre pile is unlined;

- the leachate collection trenches around the perimterer of the pile are unlined:
- dead trees hydraulically down gradient of the leachate pond which would indicate that a release is occurring and it is toxic to the trees;

Figure 6 - Trees next to pond in 1996.

Figure 7 - Trees next to pond in May 2002

The leachate at the Miller lumber site has been sampled several times over the past eight years. The leachate data was used to develop the parameter list for the ground water geoprobe investigation. Tables 1a and 1b present the inorganic and organic data of those leachate sampling events. As can be seen the ammonia level in the leachate being generated at the site has increased over time. The recirculation of leachate at the site has always been a clause of the permit for the site for dust control purposes, however Miller Lumber did not perform significant recirculation until early 2003. As can be seen the ammonia levels have increased from 289 mg/l in 1995 to 726 mg/l in 2000 to 6,780 mg/l in 2003. Total dissolved solids (TDS), COD and TKN all increased after significant recirculation began.

Based on these leachate results, DDAGW and DSIWM developed a list of parameters for the investigation. Also, consideration was taken into account that a Geoprobe sampling device would be used. It can be difficult to collect non-turbid water samples with a Geoprobe especially in fine grained sediments. Therefore, it was decided that metals would not be sampled. The leachate data demonstrated that ammonia would be a very good parameter to evaluate a release from the waste pile/holding pond complex. The analytical list included conductivity, TDS, COD, nitrite, ammonia, nitrate/nitrite, TKN, total phosphorous, and phenolics. Total phenolics was also added to the list because phenol was detected in leachate by the DHWM sampling event at a concentration of 2.65 mg/l and total phenolics was detected in Kincaid Creek by DSW at 43 mg/l. As will be seen, the parameter list provided the information necessary to determine if ground water had been impacted at the Miller Lumber site.

Table 1a - Miller Lumber Leachate Sampling Results

Sample Description / Parameter	Site #1 Sampled by D.Imhoff	Leachate Pond Overflow M.Kuklis	Leachate Pond Sampled M.Kuklis
Date	4/13/95	1/15/02	8/21/03
Conductivity (uhmos/cm)	NA	NA	33100
Total Dissolved Solids (TDS) (mg/l)	5230	1920	10800
Chemical Oxygen Demand (COD) (mg/l)	6340	1070	21500
Nitrite (mg/l)	NA	NA	0.496
Nitrite-Nitrate (mg/l)	NA	81	<0.10
Ammonia (mg/l)	289	726	6780
Total Kjedahl Nitrogen (TKN) (mg/l)	524	NA	7300
Phosphorus (mg/l)	NA	NA	22.9
Aluminum mg/l	NA	555	NA
Barium, ug/l	NA	161	NA
Calcium, mg/l	NA	22	NA
Copper, ug/l	154	17	NA
Iron, ug/l	NA	6510	NA
Manganese, ug/l	NA	2320	NA
Potassium, mg/l	NA	80	NA
Sodium, mg/l	NA	189	NA
Zinc, ug/l	989	82	NA

NA- Not analyzed

Table 1b - Organics Detected in Leachate

Location	Leachate DHWM Sample for determining if the leacahte was a hazardous substance	DDAGW Leachate Sample for VOCs from Seep 1 location on northwest side of pile
Date of Sample	9/15/2003	11/20/2003
Organics	methyl ethyl ketone (MEK) (227 ug/l) bis(2chloroethyl)ether (938ug/l) benzyl alcohol (41.2 ug/l) 3-4 methylphenol (773 ug/l) m,p-cresol (765 ug/l) phenol (2650 ug/l)	Acetone (4030 ug/l) 2-butanone (MEK) (354 ug/l) 4-methyl -2-pentanone (78.8 ug/l)

Summary of Investigation Field Activities

The original sampling plan proposal (Appendix A) outlined twelve geoprobe locations for the ground water investigation. DDAGW theorized before the investigation that ground water flow within the Kincaid Creek alluvial deposits would be to the south to southwest direction. Ten locations were selected based on this assumption and results of the investigation demonstrate the assumption was correct. However, the large amount of rainfall prior to November 19th and the presence of the waste sawdust on the Kincaid Creek floodplain increased the difficulty of getting the geoprobe positioned in the proposed locations. In fact, the Geoprobe truck had to be extracted from the sawdust/mud at locations GP-3 and GP-4. The attached map (Figure 8) shows the eleven locations chosen for sampling ground water. Even though the original proposal included two background locations, the decision was made in the field to only collect one background location based on the low conductivity reading that was measured at location GP-5. Figure 2 shows the approximate locations of the 11 geoprobe points. Appendix B includes the GPS data for each geoprobe location and a plot of the locations on an aerial photograph.

At each location the geoprobe rods were driven to bedrock. At this point the geoprobe was used to pull back the drive rods approximately four feet to expose the ground water sampling screen. One ground water sample per location was collected and submitted for laboratory analysis. Locations GP-1 through GP-5 were collected on November 19th while GP-6 through GP-11 were collected on November 20th. Two of the geoprobe locations were cored and logged for the subsurface geology (GP-1 and GP-7). Appendix C includes the logs for these two boreholes.

Figure 9 provides a generalized cross section for the Miller Lumber site. In general, there is a 10 to 15 feet thick layer of alluvial deposits consisting of clays, silts and sand and gravel underlain with bedrock consisting of a weathered blue-gray shale layer. At the two logged locations, six inches to one foot of sawdust was encountered. Several weeks prior to this investigation a hand auger was used by DDAGW and DSIWM staff to estimate the thickness of the sawdust within the old waste pile area. It was found that eighteen inches to one foot of sawdust was common. Based on the hand auger work and the geoprobe investigation it was found that beneath the sawdust veneer there is a gray to brown clay that is two to five feet in thickness. Beneath the clay layer was a five to six feet thick sand and gravel layer. Most of the gravel pieces were a half inch to one inch in size. The geoprobe had little difficulty driving the steel rods through the coarse gravel layer. Beneath the sand and gravel layer a weathered blue-gray shale was encountered, which is probably the same shale layer that outcrops within Kincaid Creek. Of the eleven borings, eight of them enountered bedrock at nine to twelve feet below ground surface. At GP-3 and GP-8 the geoprobe was able to advance the steel rods to 20 feet and 28 feet, respectively.

Even though only two geoprobe locations were cored and logged, DDAGW beleives that the geology of the alluvial deposits was fairly consistent across the site given the similarity of how the geoprobe penetrated the subsurface from location to location and based on the preliminary hand augering that DDAGW and DSIWM performed. In addition, only two of the eleven geoprobe locations had turbid water after purging several gallons of water from the borehole (GP-3 and GP-8). The low turbidity of the water in the other nine locations is an indication that the sand and gravel logged at GP-1 and GP-7 was being sampled and is present beneath much of site.

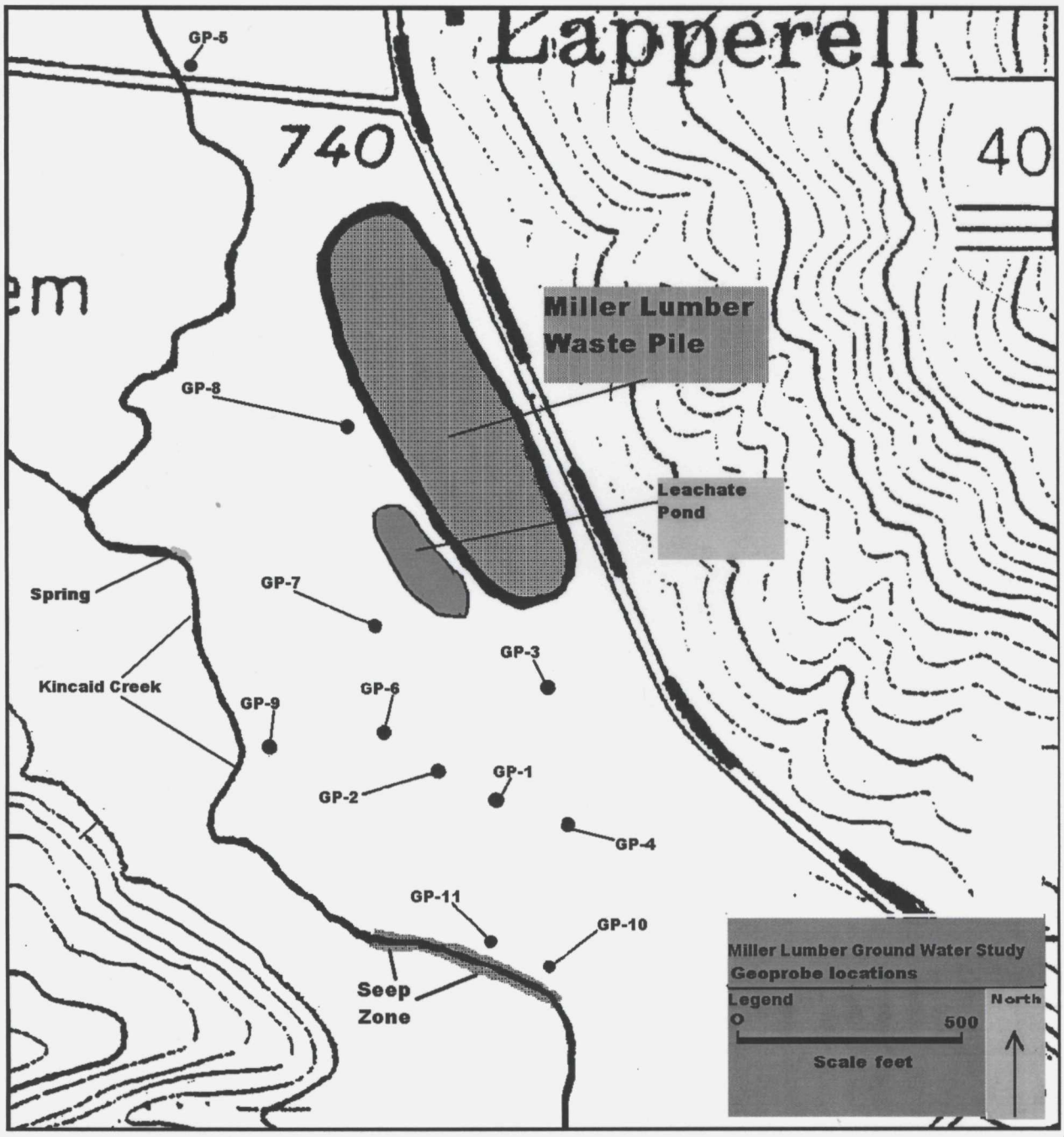


Figure 8 - Geoprobe locations where ground water was collected during the November 2003 investigation.

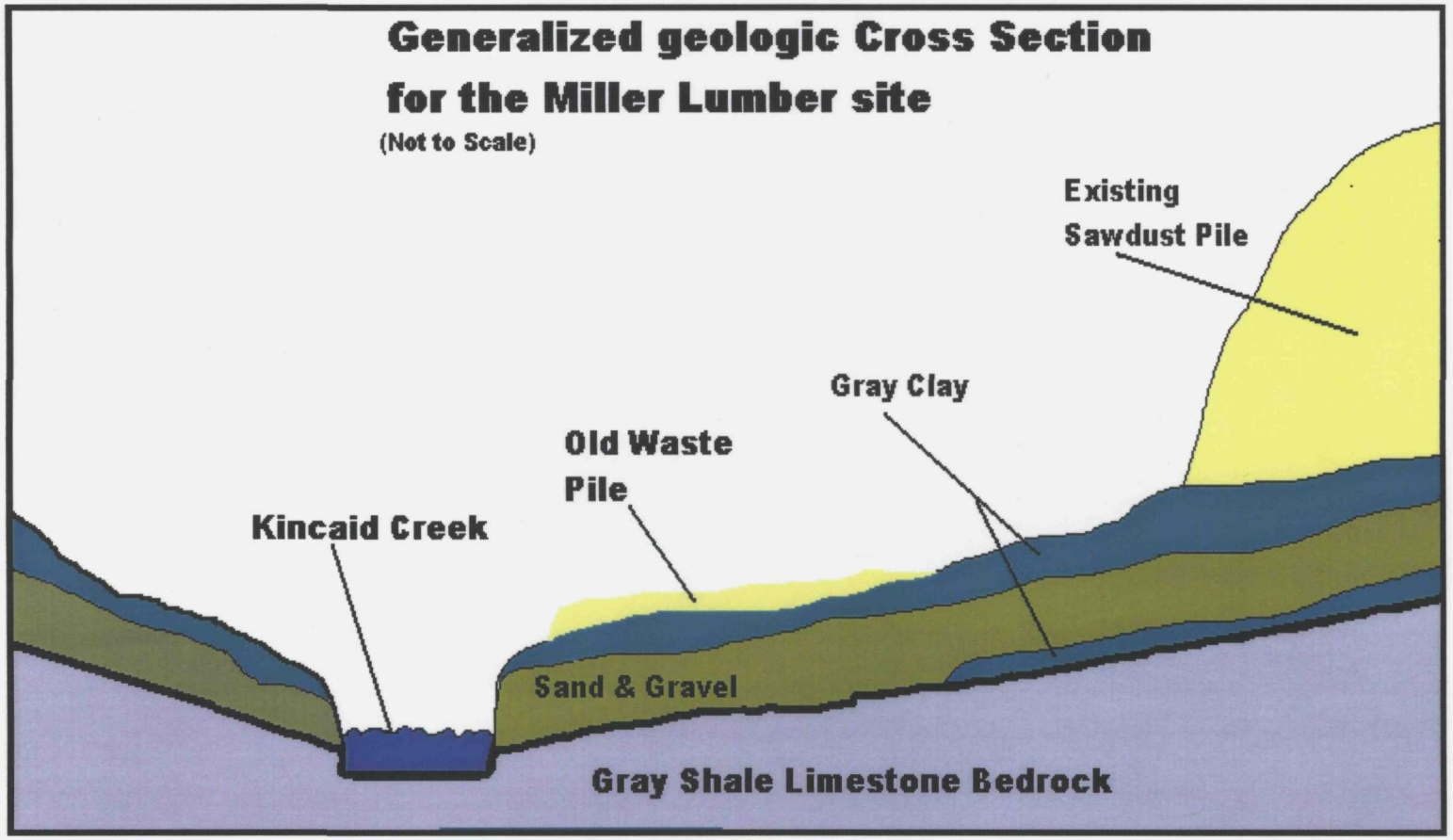


Figure 9 - Generalized cross section based on the geoprobe investigation.

Discussion of the Water Quality Results

Table 2 provides the water quality data for the geoprobe ground water investigation. Figures 10 through 15 provides site maps with the parameter concentrations plotted on the map with coloring to highlight areas of ground water contamination. A leachate sample was also taken at a leachate seep at the base of the existing pile for volatile organic compounds only. Figure 16 shows the location and the result of this seep sample.

Table 2 - Summary of November 2003 Geoprobe Sampling Effort

Location / Parameters	GP-1	GP-2	GP-3	GP-4	GP-5	GP-6	GP-7	GP-8	GP-9	GP-10	GP-11
Date	11/19	11/19	11/19	11/19	11/19	11/20	11/20	11/20	11/20	11/20	11/20
Time of Boring	11:20	12:30	13:30	14:45	16:00	10:30	11:30	12:45	14:00	15:00	15:30
Depth of Boring (ft)	11	10	20	10.5	16	10.5	11.5	28	10.8	9	9
Conductivity, uhmos/cm	3970	5300	540	810	278	3800	2500	460	750	1040	3700
TDS, mg/l	1500	1630	228	490	166	1350	1090	226	414	482	1690
COD, mg/l	750	1250	92	72	64	608	431	289	89	121	715
Nitrite, mg/l	0.163	0.203	0.091	0.07	0.091	0.155	0.166	0.243	0.144	0.074	0.134
Ammonia, mg/l	210	512	0.448	6.89	0.491	269	181	1.66	15.7	34.2	256
Nitrate-Nitrite, mg/l	0.34	0.24	0.11	24.3	0.12	0.12	3.29	0.19	25.7	26.1	0.15
TKN, mg/l	231	540	0.50	12.3	3.9	270	190	1.68	18.9	38.8	242
Phenolics, mg/l	16.7	<10	<10	<10	<10	<10	<10	NA	<10	<10	<10
Total Phosphorus, mg/l	0.495	0.355	<0.01	0.128	0.244	0.362	0.167	2.72	0.10	0.122	0.233

All units are in mg/l unless otherwise noted.

Of the ten down gradient geoprobe points, GP-2 had the highest concentration/level of conductivity, COD, ammonia and TKN. The lifetime exposure health advisory for ammonia is 30 mg/l. There is no Maximum Contaminant Level (MCL) for ammonia. As can be seen in the table, six of ten down gradient geoprobe points encountered ammonia at levels above the 30 mg/l health advisory. Nitrite has an MCL of 1 mg/l whereas, nitrate-nitrite and nitrate have an MCL of 10 mg/l each. There are no exceedances of the nitrite MCL. GP-4, GP-9 and GP-10 all exceed the nitrate-nitrite MCL. Taking the nitrate-nitrite concentration and subtracting the nitrite concentration one can infer the nitrate concentration. As can be seen, GP-4, GP-9 and GP-10 all have nitrate concentrations above the MCL. Phenol has a lifetime exposure health advisory of 4 mg/l. The 16.7 mg/l of phenolics at GP-1 could indicate that phenol can be found at the site above the health advisory.

GP-5 was selected as a background location. The water quality results for GP-5 show some slight impact based on the COD level of 64 mg/l, ammonia at 0.491 mg/l, and TKN at 3.9 mg/l. However, using GP-5 as a background concentration for comparison purposes for the Miller Lumber site, it is evident that there are concentrations above background near the waste pile-holding pond complex.

Ammonia is the best indicator of the waste pile leachate. GP-5 had an ammonia concentration of 0.491 mg/l. The average ammonia level for the downgradient geoprobe locations was 148 mg/l. The range in concentration within the plume was 6.89 mg/l to 512 mg/l. The background conductivity was 278 umhos/cm, whereas the average down gradient conductivity was found to be 2287 umhos/cm. The conductivity range encountered in the plume was 750 uhmos/cm to 5300 uhmos/cm. TDS had a background value of 166 mg/l. The average downgradient TDS concentration encountered in the other ten locations was 910 mg/l, while the TDS within the plume ranged between 414 mg/l to 1690 mg/l. The background COD value was 64 mg/l at GP-5 and the downgradient locations showed an average COD value of 441 mg/l. The COD range encountered was 72 mg/l to 1250 mg/l. As seen in table 2, locations GP-1, GP-2, GP-6, GP-7, and GP-11 show the greatest impact from the site. Clearly, based on the sampling data the Miller Lumber waste pile/holding pond complex has impacted ground water.

The concentrations of the water quality parameters were plotted on base maps of the site to evaluate the ground water contaminant plume distribution (Figures 10-15). There is a well defined area of ground water contamination to the southwest of the waste pile. Looking at figure 10, there is a highly concentrated area of ammonia contamination present at the site. The contamination appears to extend from the pond through the field of the old waste pile and to Kincaid Creek. The area of impact, or the plume of contamination, appears to be approximately 400 feet wide and 750 feet long. An interesting finding is that the zone of contamination seems to extend to the 200 feet long area of seeps along Kincaid Creek. The concentration map for TDS, COD, and conductivity show a similar geometry and extent. The nitrate-nitrite data and corresponding map show another interesting finding. Where the ammonia levels are very high (e.g. above 200 mg/l) the nitrite-nitrate is very low. This occurs in the interior of the plume. Where there is ammonia contamination, but the levels are less than 200 mg/l, the nitrate-nitrite is elevated. As shown in Figure 14 the nitrate-nitrite levels are high on the periphery of the plume where the ammonia is being oxidized from NH_3 to NO_2/NO_3. In the interior of the plume, most of the available oxygen has been consumed by the oxidation of NH_3 and the constant release of ammonia to ground water gives rise to the high ammonia levels without NO_2/NO_3.

Figure 15 shows the results from the phenolics analysis. The results show that phenolics was found in one of the ten geoprobe samples collected (GP-8 did not have a phenolics sample due to low volume of water). The leachate was sampled by the OEPA-Division of Hazardous Waste Management (DHWM) in 2003 to determine if it was a hazardous substance. Only phenol was sampled and the result was 2.65 mg/l. The phenolics analysis that was performed on the ground water and the surface water samples demonstrate phenolics occur at the site but the results do not show a well defined area of impact. Figure 16 shows the location of seep sample collected by OEPA-DDAGW for VOCs. The concentration of the three VOCs detected are also plotted on the map. Future investigation work should include sampling for VOCs.

Given the water quality data, the geology encountered, the fact that the liner of the pond has been compromised, and the trees down gradient of the pond have died, it seems reasonable to conclude that the pond is the predominant source of the ground water contamination. The existing waste pile and the old waste pile are probably contributing to the ground water contamination as well. The concentration maps show ammonia is GP-8 to be three times the ammonia in GP-5. COD is nearly five times higher in GP-8 than found in GP-5. GP-3 also shows COD above GP-5. Conductivity and TDS measurements show that GP-3 and GP-8 both have higher levels of these parameters than GP-5. So, the pile is contributing some contamination to the overall ground water impact. Quantifying the contamination contribution from each of the potential source areas was beyond the scope of this investigation, however.

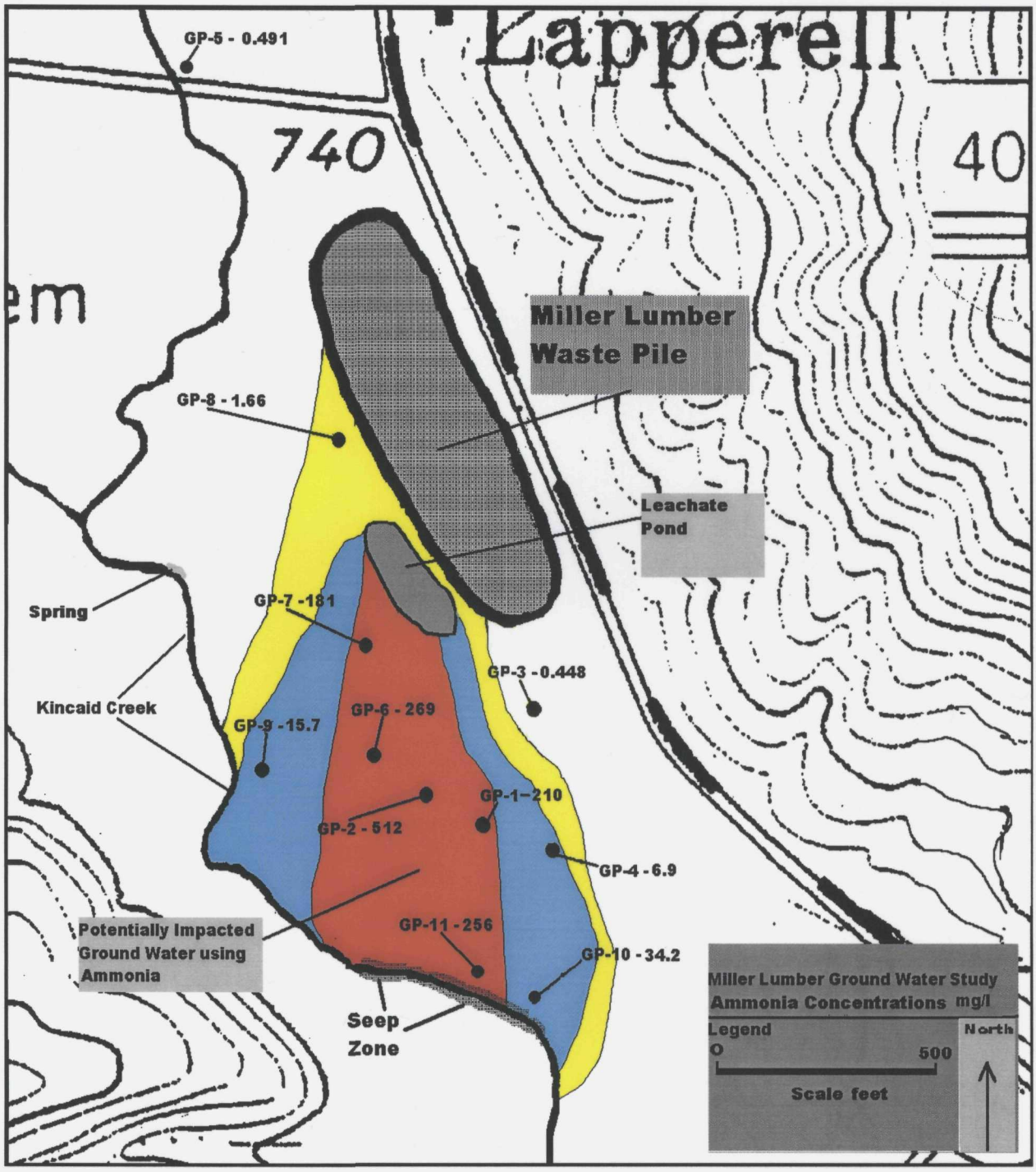


Figure 10 - Ammonia concentrations from the November 2003 OEPA Ground Water Investigation

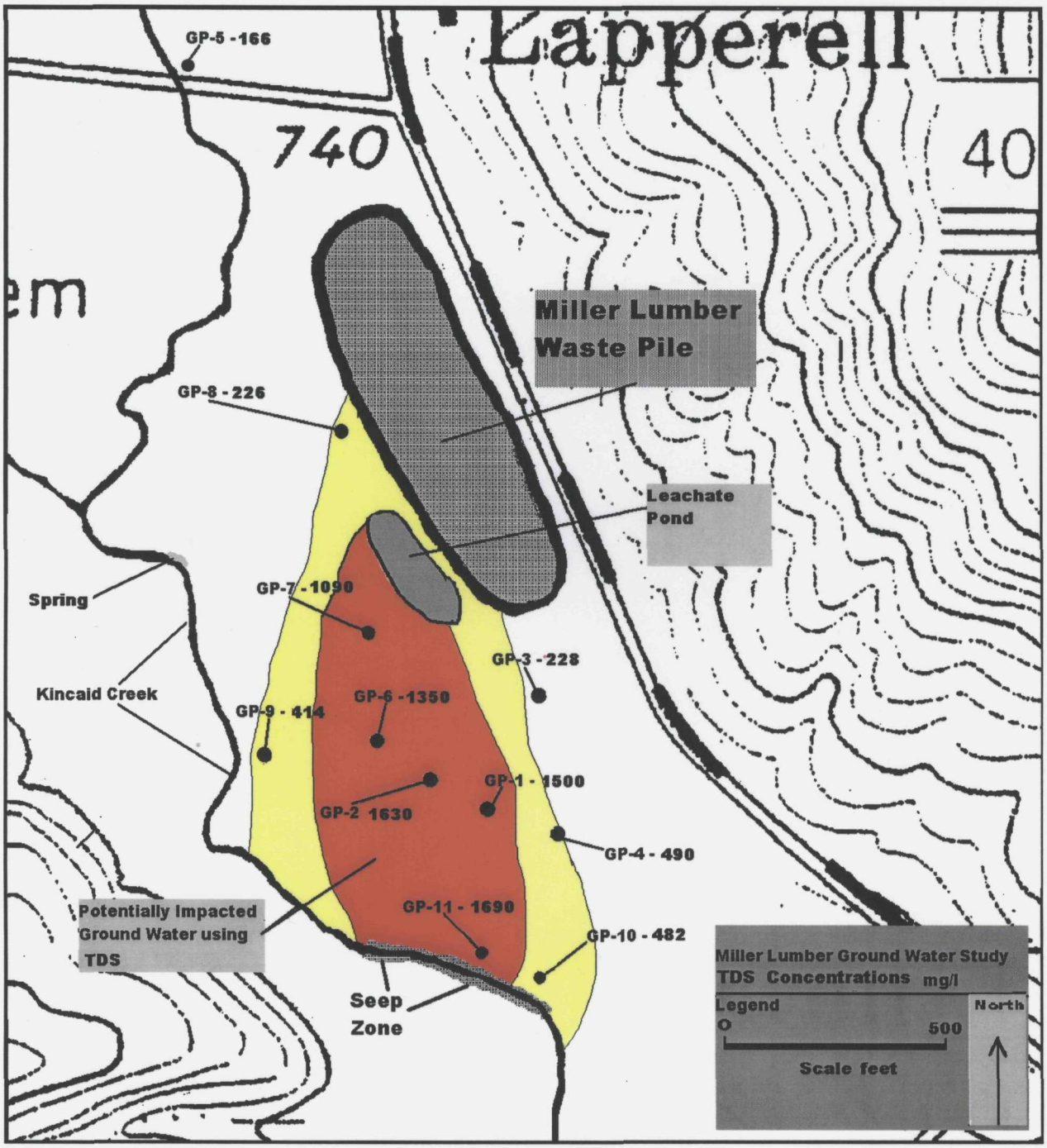


Figure 11 - TDS concentrations from the November 2003 OEPA Ground Water Investigation

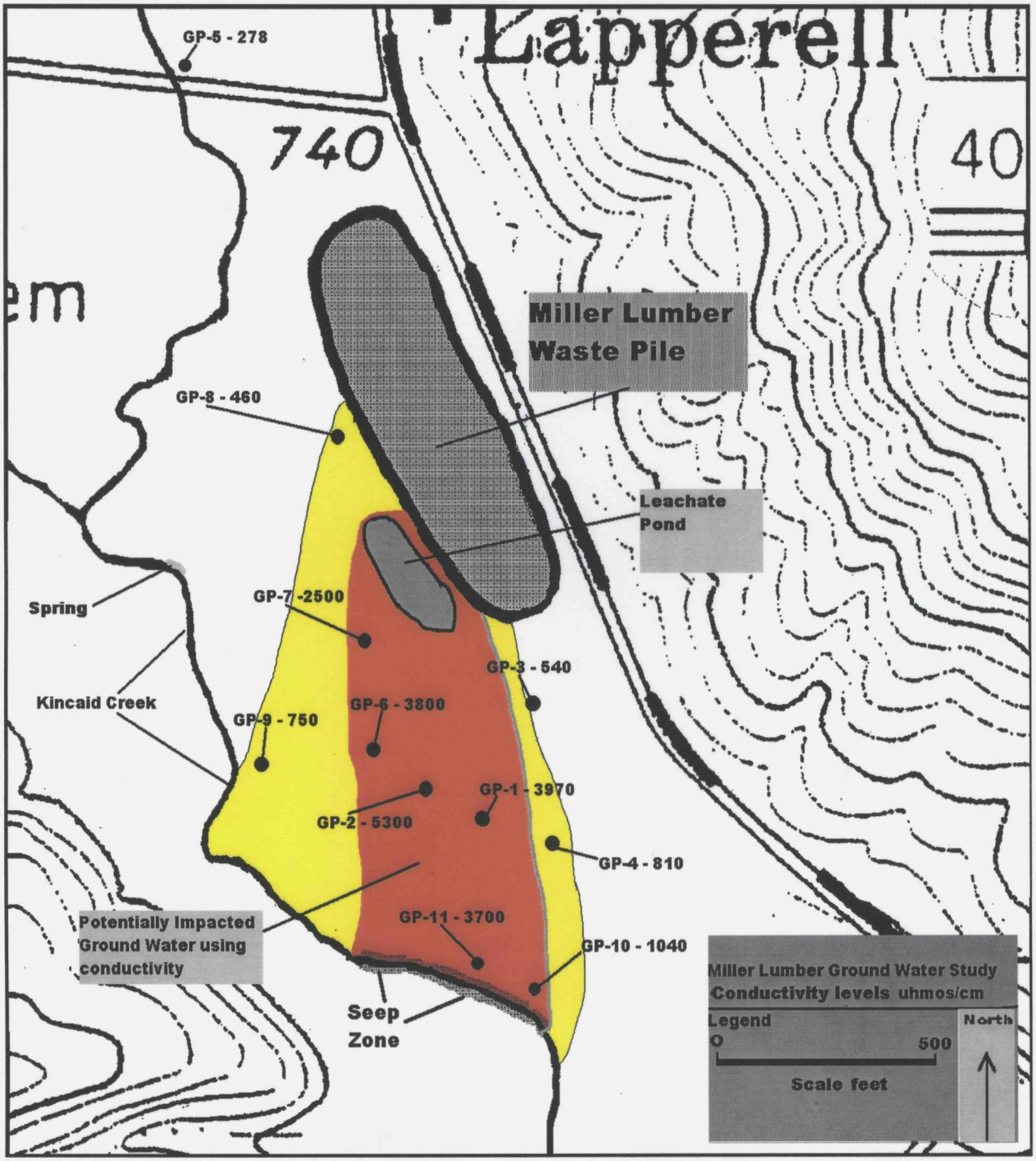


Figure 12 - Conductivity levels from the November 2003 ground water investigation.

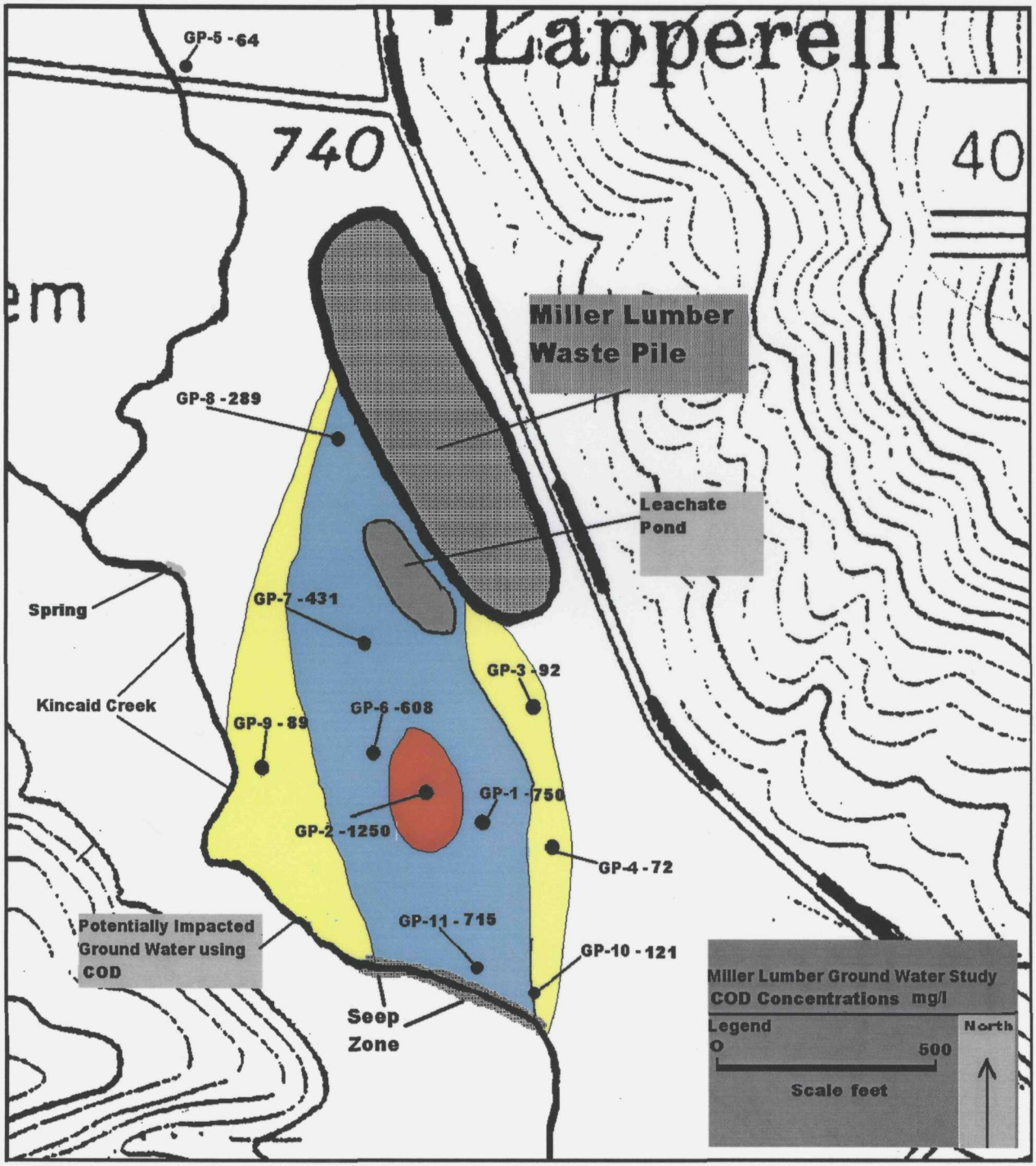


Figure 13 - COD concentrations from the November 2003 OEPA Ground Water Investigation

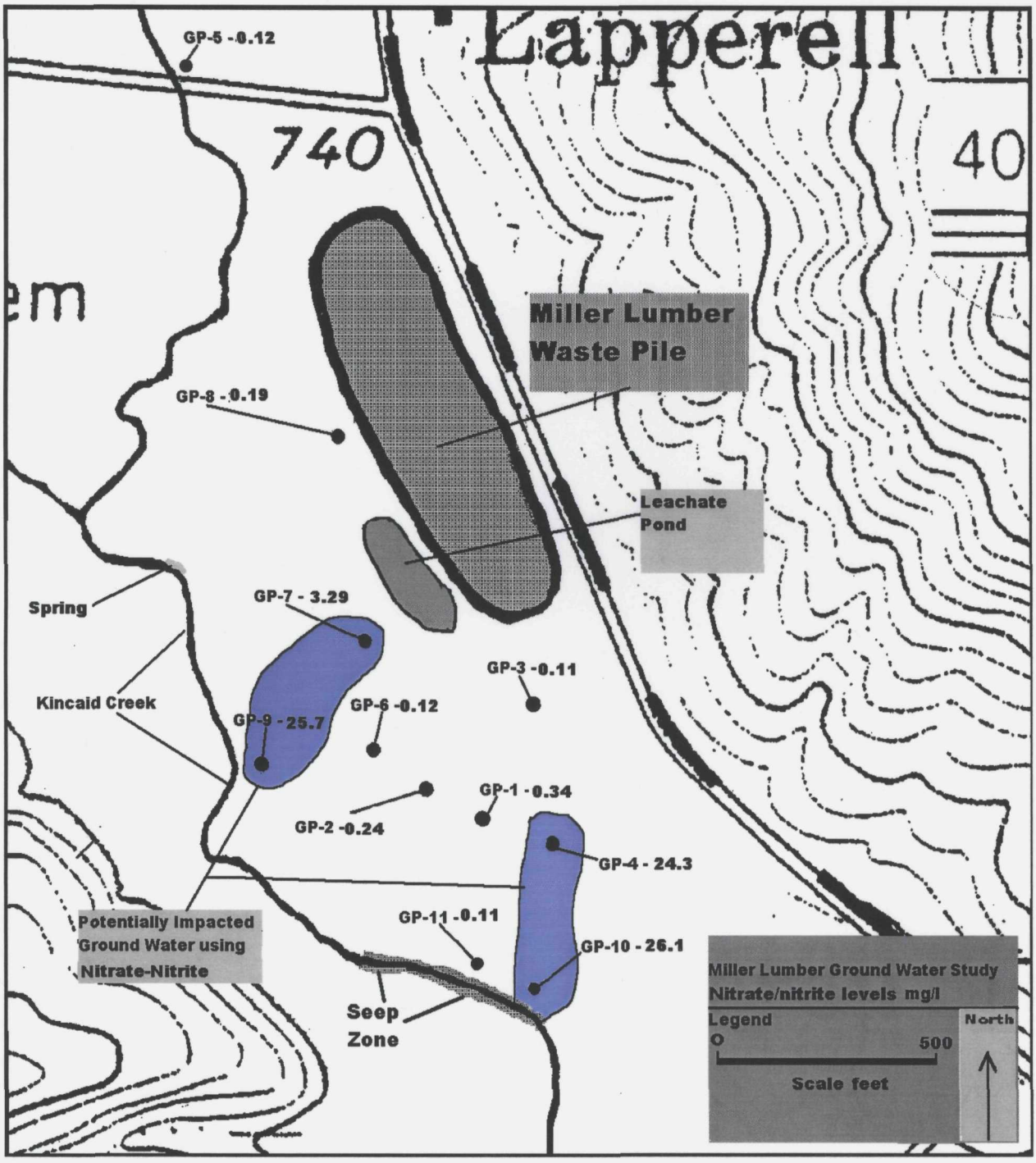


Figure 14 - Nitrate/Nitrite concentrations from the November 2003 OEPA ground water investigation.

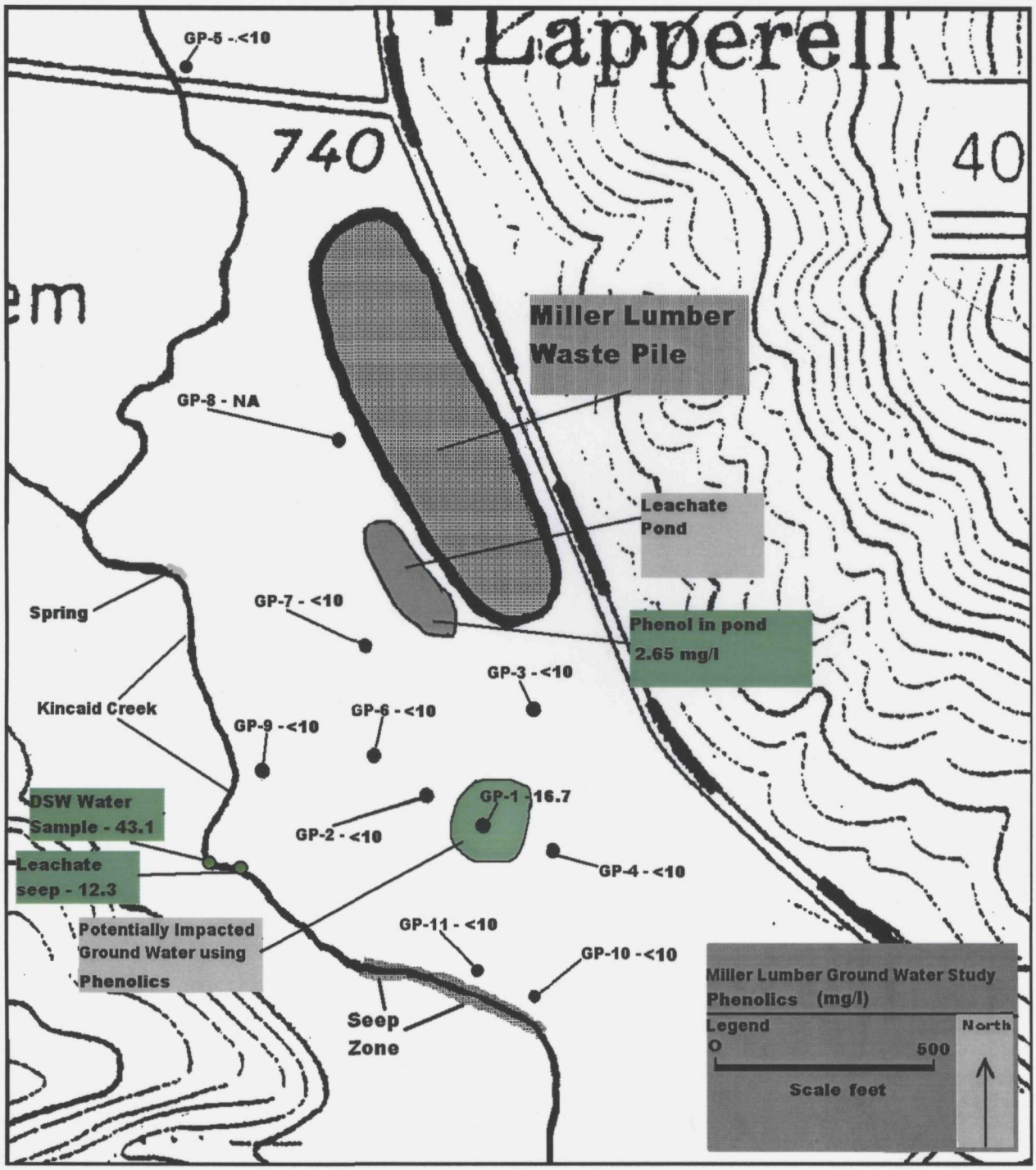


Figure 15 - Total Phenolics concentration detected in ground water from the November 2003 investigation. Also plotted on the map is Total Phenolics from DSW sampling and Phenol from a DHWM 2003 sampling of leachate.

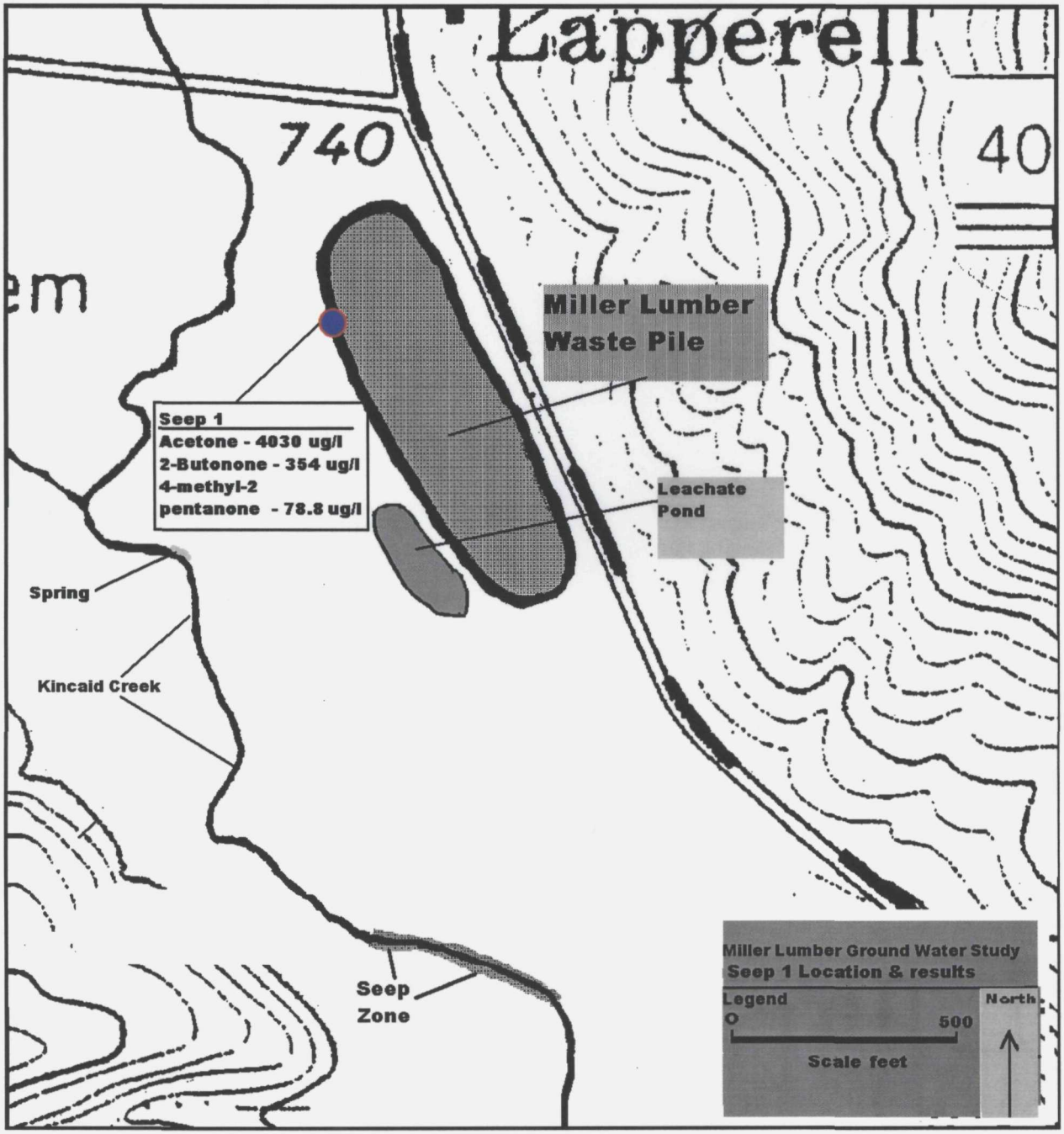


Figure 16 - Location and VOC results of the Seep 1 sampling location.

Ground Water in Relation to Surface Water

Kincaid Creek appears to be affected by the Karst Terrain in western Pike County. Given the presence of sink holes, jointing and limestone present within the Kincaid Creek, it is highly probable that there is a network of subsurface conduits and caverns along the stream channel. It is also highly likely that Kincaid Creek is directly connected to Kincaid Spring. What percentage of the flow from Kincaid Spring is from Kincaid Creek has not been determined. As noted previously, black leachate was released from the Miller Lumber site in summer of 2003 and turned the creek water black. A significant volume of this discolored water entered a sink hole near the site. Coincident with the release from Miller Lumber and the collapse of the sink hole, Kincaid Spring water became discolored as well. This is based on observations of Mr. Miller and ODNR Fish Hatchery employees. Even though the large sink hole has been filled in, numerous joints cross the stream channel and each one has the potential to create another sink hole or act as a subsurface conduit. In fact, approximately ten feet downstream of the filled in sink hole a small opening currently directs surface water into the subsurface. As demonstrated by the large release in the Summer of 2003, any impact to Kincaid Creek from the Miller Lumber site can have an impact on the spring water quality.

Figure 17 shows the ammonia results of the surface water sampling events, leachate sampling and from sampling Kincaid Spring. The surface water data is from a DSW study conducted in August/September 2003. Background sampling on Kincaid Creek upstream of the Miller Lumber site show ammonia levels to be non detect or below 0.05 mg/l. However, the chronic discharge of contaminated ground water via multiple seeps along Kincaid Creek south of the pile combined with leachate overflows from the pond and runoff from the old waste pile footprint has impacted the water quality of Kincaid Creek. Ammonia levels increase from non-detect up stream of the site to 4.88 mg/l to 87 mg/l within a 2500 feet length of Kincaid Creek. Concentrations of ammonia in the Kincaid Spring have ranged between1.42 to 3.49 mg/l in 2003. In 1996, when DSW sampled the spring, the ammonia was nondetect.

Concluding Statement

Sampling by DSW staff has demonstrated that Water Quality Standards have been violated on Kincaid Creek. The geoprobe investigation has demonstrated that health Advisory Levels and MCLs have been exceeded in ground water at the site. The specific mass of contamination emanating from each of the various sources/pathways to Kincaid Creek and ultimately to Kincaid Spring would require further investigation to quantify. Regardless, based on the information provided in this study and previous water quality sampling events, the Miller Lumber site is polluting waters of the state.

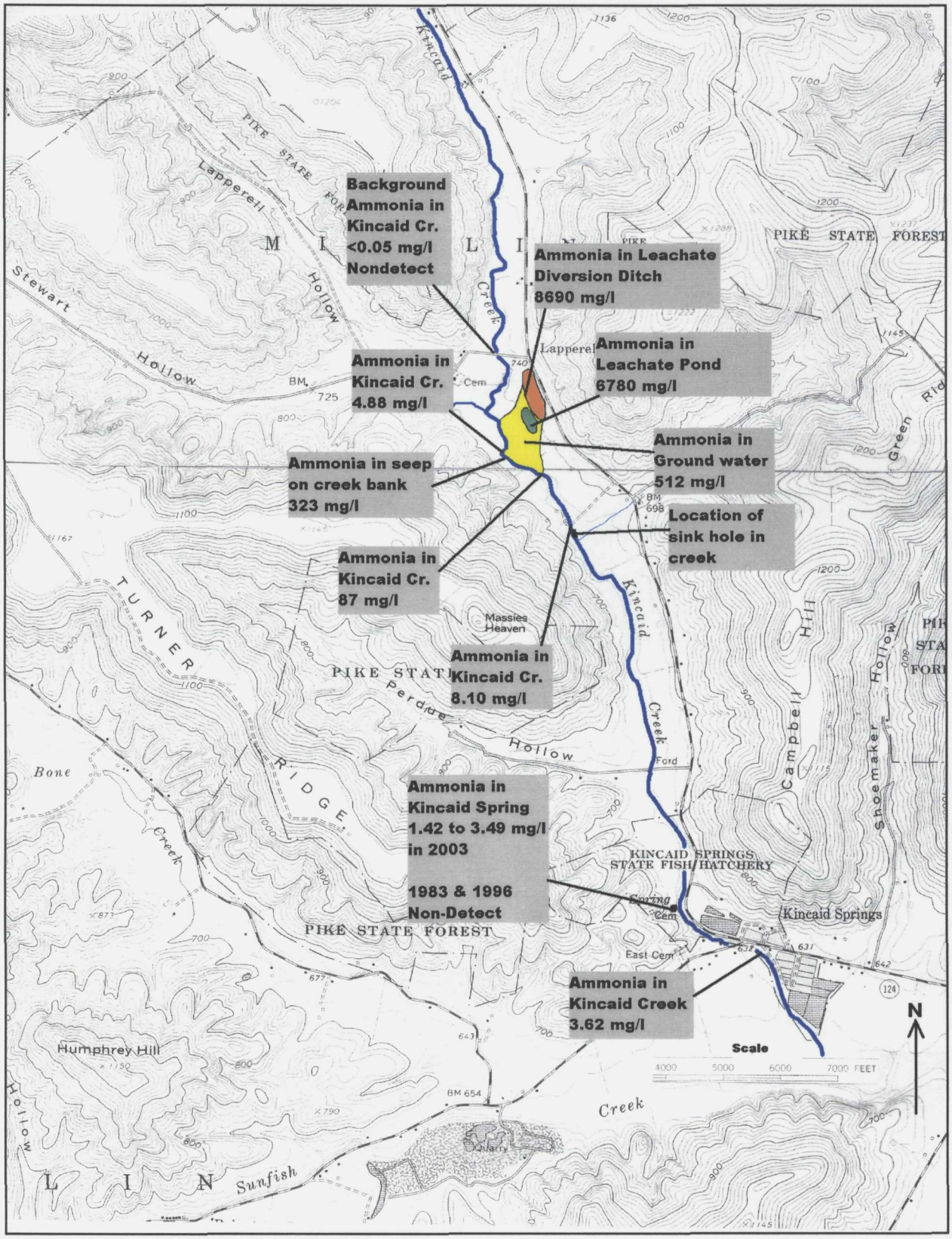


Figure 17 - Ammonia data from the November 2003 ground water study and surface water data from DSW sampling events in 2003.

Appendix A

OEPA Ground Water Investigation Sampling Plan for the Miller Lumber site

OHIO EPA "QUICK" SAMPLING PLAN

SITE NAME: Miller Lumber/Miller Salvage (AKA Miller Lumber)

ADDRESS: Mifflin Township, Latham, Ohio

COUNTY: Pike Co.

OHIO EPA DISTRICT: SEDO

DIRECTIONS TO SITE: The site is located in Mifflin Township to the west of Waverly, Ohio in western Pike County near Latham. Take State Route 124 west through Latham, Ohio. At the Kincaid Springs State Fish Hatchery turn right (or north) onto Lapperell Road. The Miller Lumber Office is located across from the Green Ridge Road-Lapperell Road intersection. The Miller Lumber waste pile is located just south of the Stewart Hollow Road-Lapperell Road intersection on the west side of Lapperell Road (Figure 1).

GROUNDS WARRANTING SAMPLING EVENT: The Miller Lumber site consists of a five acre waste pile (originally permitted for 2.5 acres), comprised of ground waste particle board from Mills Pride in Waverly. The unlined five acre pile is generating leachate with high concentrations of ammonia (>8000 ppm). A holding pond on the west side of the site is used for collecting the leachate which is recirculated back onto the pile. The leachate is brown to black in color and has a strong ammonia smell. The holding pond has recently been breached and leachate has migrated over 500 feet of open field to Kincaid Creek to the west of the pile. Between the exisitng pile and Kincaid Creek there exists the footprint of an old wood waste pile. The amount of wood waste left in place is unknown within this area.This area is over 3-5 acres in size. Puddles of brown to black water can be seen in this field.

Kincaid Creek flows over bedrock consisting of black shale and dolomite/limestone beneath. The bedrock is highly jointed perpindicular to stream flow. During the leachate release from the holding pond from Miller Lumber, a sink hole was discovered within the stream bed which redirected stream flow into the subsurface. Fred Miller, owner of Miller Lumber operations, informed OEPA that Kincaid Creek was flowing black and that 99% of the stream flow was entering the sink hole. Mr. Miller also admitted that the black water was from his site and the result of the breach of the holding pond.

Kincaid Springs is located approximately one and a half (1.5) miles downstream of the Miller Lumber site (figure 1). This spring flows between 1900 gpm to 5000 gpm and is used as the only water source for the Kincaid Springs State Fish Hatchery. Residents living in the Mifflin Township area also use the spring for drinking water due to a high sulfur content in private wells. When the release was occurring at Miller Lumber, the fish hatchery noted that the spring water turned brown to black in color and took precautions

to protect the fish stock at the hatchery. To ensure that the fish hatchery has a safe source of water, Ohio EPA is working to address the environmental issues at the Miller Lumber site.

Along Kincaid Creek there are seeps on the east stream bank. The seeps have an orange-red to brown to black discoloration. One prominent zone of seepage occurs along Kincaid Creek near the old waste pile footprint. It is estimated that this seep encompassess approximately 200 feet of stream bank. During recent site visits, reddish-orange and black water was seen eminating into the creek from this seep area.

Ohio EPA has performed several sampling events at this site over the summer of 2003. Sampling of the stream, seeps, leachate pond, Kincaid Spring and private wells installed into limestone has been conducted by Ohio EPA. An investigation of whether ground water within the Kincaid Creek valley alluvial deposits has been impacted by the Miller Lumber site has not been implemented. However, given the presence of the seeps and the discoloration of the water coming out of the seeps on the east bank of Kincaid Creek, it seems likely that ground water has been impacted. In addition, there are dead trees hydraulically down gradient of the leachate pond which would indicate that a release is occurring and it is toxic to the trees. It should also be noted that along with the overflow of the holding pond recently, the 5 acre pile is unlined, the leachate collection trenches around the perimterer of the pile are unlined, the leachate holding pond liner has been damaged and there is an unknown quantity of waste along Kincaid Creek within the footprint of the old, unpermitted waste pile. All of these represent potential sources for pollution of waters of the State of Ohio. A ground water investigation will provide additional information that will help quantify the impact of the site on the environment.

GOALS:

1. To determine if the ground water within the Kincaid Creek Valley alluvial aquifer has been impacted by waste storage and disposal activities at the Miller Lumber site.

2. To determine if the leachate seeps in Kincaid Creek are connected to waste storage and disposal activities at Miller Lumber.

PROPOSED SAMPLING and/or SCREENING:

1. **Proposed sampling date:** During the 3rd week of October 2003

2. **Proposed sampling locations:** Twelve (12) Locations - Two (2) background locations that will be dependant on site access will be sampled and ten (10) down gradient locations (See figure 2). The sampling locations were selected based an assumed ground water flow direction down valley to the south and the presence of discolored seeps along Kincaid Creek.

3. **Proposed number of samples:** Twelve (12) ground water samples will be colelcted via

the DERR-SIFU geoprobe and will be analyzed for ammonia, nitrate, nitrite, Total Kjeldahl Nitrogen/phosphorus (TKN/TP), total dissolved solids, COD and phenol.

4. **Sampling procedures:**

This investigation will utilize the DERR-SIFU geoprobe to collect ground water samples. The SIFU Geoprobe has been used throughout the State of Ohio to investigate soil and ground water contamination at many different types of regulated and unregualted sites. It is a reliable tool for determining extent of contamination and the DERR-SIFU staff are highly trained professionals with years of experience. The ground water samples will be analyzed for ammonia, nitrate, nitrite, TDS, TKN/TP, COD and phenol as markers for contamination from the Miller Lumber site.

At three of the proposed 12 locations within the Kincaid Creek Valley alluvial deposits, cores of the unconsolidated deposits will be collected to help characterize the geology within the valley. At all twelve (12) locations the geoprobe rods will be driven to bedrock. It is anticipated that bedrock will be at a depth of approximately 10 feet. It is anticipated that ground water samples will be collected at a depth within 2 feet above the bedrock surface, however attempts will be made to collect the samples just below the water table surface. Personal protective procedures, sample collection, sample screening and field decontamination will be performed according to Ohio EPA-DERR's Field Standard Operating Procedures, Volume 4, April 1997, specifically sections 16.01 and 17.01 (attached). All boreholes will be filled to the surface with bentonite pellets. Investigation-derived waste will be managed in accordance with the Ohio EPA Investigation-Derived Waste Management Guidance, DERR-00-RR-011, dated 1 June 1994. Investigation-derived wastes will generally consist of disposable vinyl and nitrile gloves, latex boot covers, and detergent water. These items are used primarily for prevention of cross-contamination and for sanitary considerations during sampling activities.

All sampling locations will mapped based on GPS measurements in the field.

STAFF ASSIGNMENTS: Dan Bergert, DSIWM-SEDO Inspector and Project Coordinator
Dave Hunt, DDAGW-SEDO Geologist
Karl Reinbold, DERR-SIFU Geoprobe Technichian

Costs of the Investigation

OEPA DES Lab will be used. Below are the costs of the analysis for twelve ground water samples.

Parameter	Method ref #	Holding Time	Cost	Total Cost for 12 samples
Nitrite	353.2	48 hrs	$12	$144
Ammonia/Nitrate	353.2	28 days	$20	$240

Total Dissolved Solids	160.1	7 days	$11.25	$135
COD	410.4	28 days	$12	$144
TKN/TP	351.2/365.4	28 days	$22	$264
Phenolics	420.1	28 days	$71.50	$858
			TOTAL	$1785

Only one DDAGW geologist will be needed for this investigation. The geologist will be logging the three selected boreholes that will have core samples taken and collecting ground water samples. The geologist will also assist in the decontamination of the geoprobe rods between sample locations. The DERR-SIFU technician will be responsible for the operation of the geoprobe. It is possible that DERR-SIFU will want to have two geoprobe technicians present for this investigation. It is likely that only one will be necessary, however, given the prior experience of the geologist with SIFU investigations.

Total field time expected for the investigation - Two 9 hr days.

Number of non-DSIWM field personnel needed - Two 1 DDAGW Geologist
1 DERR-SIFU Technician

Salaries of Field Personnel: SIFU Tech - $27 per hr
2nd SIFU Tech that is an ESPEC3 (if needed) - $29
18 hours for SIFU-Tech = $486
18 hours for a 2nd SIFU Tech (if needed) = $522

TOTAL COST of PERSONNEL = $486
If a second SIFU tech is needed then the cost would be $1008.

TOTAL COST OF INVESTIGATION: $2271

Total Number of Containers

No. Samples	Container Type	Total
12	1 liter Glass H_2SO_4	12
12	1 liter plastic w/H_2SO_4	12
12	1 liter plastic NP	12

Appendix B

GPS Coordinates for the Geoprobe Locations for the Miller Lumber site

To: Dave Hunt, DDAGW-SEDO

From: Karl Reinbold, DERR/SIFU-CO

Subject: GPS Latitude and Longitude of Geoprobe sample points, Miller Lumber sampling project for DSIWM-SEDO

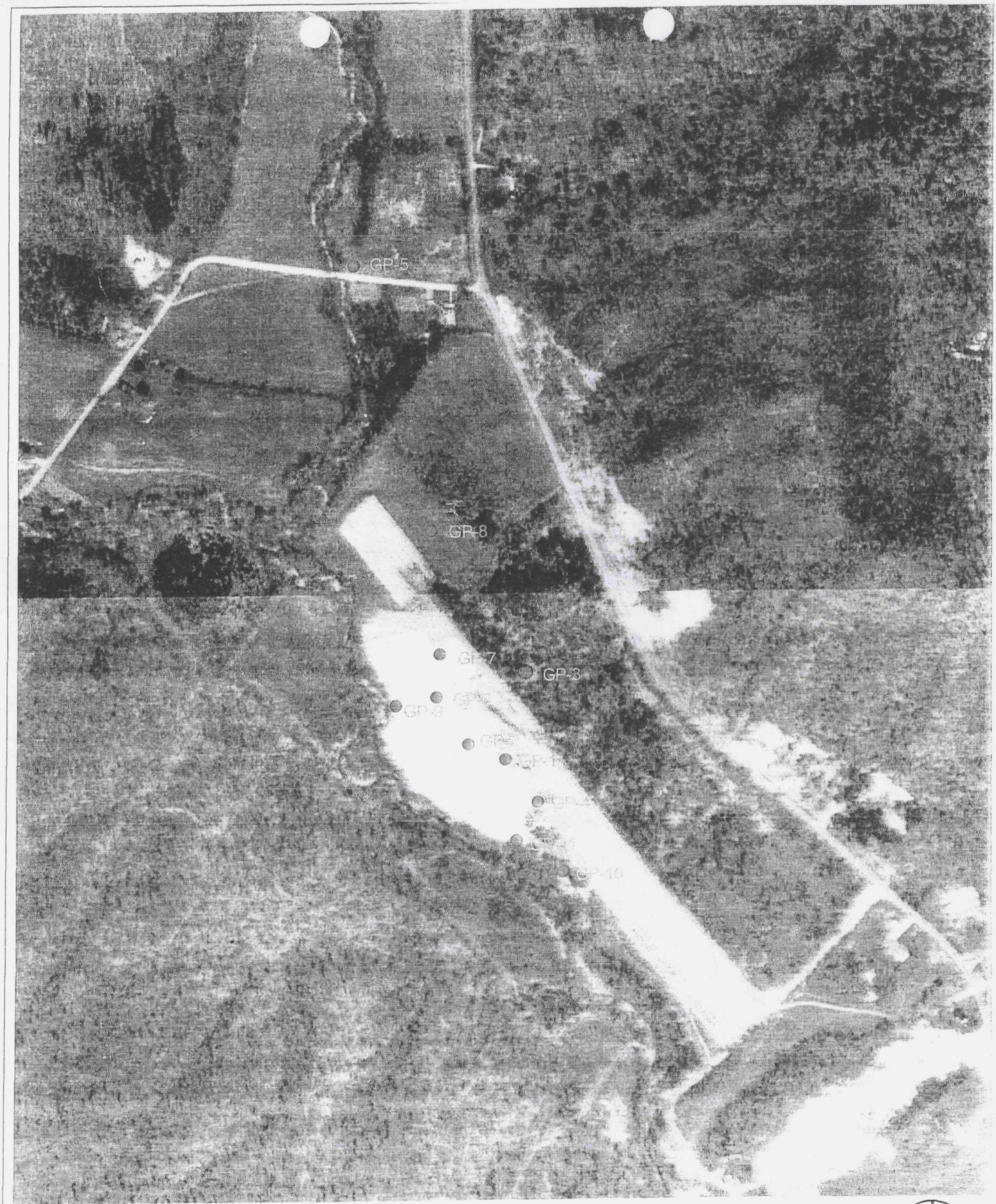
Date: December 11, 2003

On November 19 and 20, 2003, DERR-SIFU assisted DDAGW-SEDO and DSIWM-SEDO in providing Geoprobe® sample support for the collection of ground water samples at the Miller Salvage (aka, Miller Lumber) site in Lapperell, Pike County, Ohio.

Sample location coordinates were collected using a Garmin eTrex Vista hand held Global Positioning System (GPS) unit. In utilizing this unit, the position resolution and accuracy to the actual geographic point may be skewed by 15-25 feet. Sub-meter accuracy is obtainable with another GPS unit that SIFU maintains, but was not available during this sampling event. However, for the purposes of this investigation, these coordinates should serve the intended purpose. The GPS coordinate data were employed for preparation of the attached map of all sample locations superimposed on an aerial photograph (circa early 1990's) of the site

The following are geographic coordinates for sample points collected during Miller Salvage Investigation:

GP-1	N 39° 07.549'	W 083° 16.654'
GP-2	N 39° 07.558'	W 083° 16.684'
GP-3	N 39° 07.601'	W 083° 16.638'
GP-4	N 39° 07.523'	W 083° 16.631'
GP-5	N 39° 07.840'	W 083° 16.773'
GP-6	N 39° 07.586'	W 083° 16.709'
GP-7	N 39° 07.613'	W 083° 16.706'
GP-8	N 39° 07.688'	W 083° 16.713'
GP-9	N 39° 07.581'	W 083° 16.738'
GP-10	N 39° 07.482'	W 083° 16.609'
GP-11	N 39° 07.500'	W 083° 16.645'



Miller Lumber Site
DSIWM/SIFU Geoprobe Sampling Points

300 0 300 600 Feet

Appendix C

Boring Logs for GP-1 and GP-7 from the Miller Lumber Site

Soil Boring Log

Site: Miller Lumber	Driller: Karl Reinbold
Boring ID: GP-1	Logger: Dave Hunt
Time: 11:30	Date: 11/19/03
Weather: M. Cloudy 58	Page: 1

Core Depth (ft)	Recovery (ft)	Sample Core Description
0-4	3	Top 2' is gravel and sawdust fill. Brown in color. Bottom foot is gray clay with some silt grading into a brown sandy silt at bottom. Moist.
4-8	3.5	Top 3"is gray clay grading into coarse grained sand with some gravel, brown in color. Gravel size is approximately ½" in size. Bottom 2" is is brown sand. Moist.
8-11	3	Brown coarse grained sand with some silt and gravel. Noticable zones of saturation. Blue shale bedrock at bottom.

Soil Boring Log

Site: Miller Lumber	Driller: Karl Reinbold
Boring ID: GP-7	Logger: Dave Hunt
Time: 11:40	Date: 11/20/03
Weather: Sunny 60	Page: 1

Core Depth (ft)	Recovery (ft)	Sample Core Description
0-4	20"	6" of sawdust and 14" of brown silt and clay, semi-moist
4-8	4	2 ft of brown clay silt with increasing sand content with depth. Wet zone at 2.5 ft. Bottom 1 ft is light brown, yellowish gravel mixed with sand, silt and clay. Gravel is 1" in size. Moist to wet.
8-12	4	Top 1" is saturated. Brown gravel with clay and silt. Grades into a brown gray silty clay slightly moist. 4" of weathered gray shale at bottom